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I. Introduction

Education is a vital component to the health and growth of our economy, a gauge of our own technological skill level and future work force productivity, and is a reflection of our society's values and norms. It is the concern of every parent and prospective business owner, as the young adults in our current school system today are the future of our economy. Today, education is in the forefront of the news and politics, especially after the introduction of the No Child Left Behind Act (NCLB) of 2002. As the public's concern for our youth's education increases and as public policy focuses more on improving the quality and outcome of our primary and secondary education system, it is imperative to us, as a developed nation, to find what influences our youth's ability to graduate from high school.

Understanding which variables affect high school graduation will enable us to act in a way that is beneficial to society, creating policies that encourage education and eliminating reasons for students to drop out. Furthermore, we'd be able to evaluate what factors in our communities and neighborhoods matter the most and focus our attention on the local level. Examining the Detroit Metropolitan area, we'd be able to enact policies that not only emphasize education but strengthen Michigan's economy by focusing efforts to improve education in skilled automotive labor and by diversifying high tech jobs beyond the scope of the automobile. This would create new standards or norms that will last beyond our current generation. Education is our future and without this perceived value of importance, our economy will flounder.

Using data from over seventy high schools in forty districts, this paper determines which factors are associated with the graduation rate of high school students within the Metropolitan Detroit area. Focusing on the Metro-Detroit area is vital to the well-being of Michigan. This study can help develop a sense of economic health of the future of our economy, absent of external expected outcomes. Increasing the graduation rate of secondary education will offer solutions to help maximize the potential for our human capital in the Detroit area and minimize the costs of losing a local working base, failing to meet the needs of a high technology economy.

This paper examines, at the district level, the Metropolitan Detroit high school graduation rate and its relationship between the level of poverty in the district, crime rate of the city, student body make-up, class size or teacher ratio, local taxes going toward schools, and students passing the Michigan Educational Assessment Program (MEAP) tests in science and math.

II. Literature Review

Heckman (2007) discusses the trends in high school graduation and drop-out rates over the past fifty years using national data from the U.S. Census and Common Core of Data (CCD). He defines actual graduation versus the completion of a GED, debating what exactly qualifies as a high school graduate. Heckman adjusts for the fact that certain groups are not accurately represented in the estimated rates. For example, the incarcerated are lower than the average population in terms of education, so there is a strong negative causal relationship between education and crime, causing biases in both black and male populations. The armed forces is another group not accurately represented, though Heckman states that this under representation doesn't cause bias in the estimated graduation rate because most enlisted personnel have obtained a diploma or GED. Immigrants are another group misrepresented, stating that "a meaningful evaluation of the performance of U.S. educational system should not include people who never attended U.S. schools or those who did so only briefly (Heckman, 2007)."

The main focus of Heckman's paper is to argue that there are data collecting biases and interpretations between different statistical agencies and how he controlled for some of these biases. Though, this paper is a time trend analysis and no regression was performed, it helped establish some variables that have influence on the graduation rate, such as crime, gender and race. Also, it brought to light the possibility that my analysis might be biased. As this paper focuses on trends, I plan to use similar variables in crime, gender, and race that could influence high school graduation rates but using Ordinary Least Squares regression analysis.

Dearden (2005) discusses the possibility that education is "seen as a way for individuals to escape poverty and welfare dependency," motivating governments to focus their attention towards education as a way to combat poverty. Many OECD countries have made their secondary or college education free, while increasing the "compulsory school leaving age" from 14 to 16 years old since the Second World War. Some countries created means-tested grants to students as incentives to stay in school. Opinions are mixed about any significant correlation between school participation and monetary incentives.

This paper "examines the impact of a program that subsidizes children to remain in school for up to two years beyond the statutory age (Dearden, 2005)." The results of data collected from England's national Education Maintenance Allowance program indicate that the impact of subsidies on the graduation rates of students is quite substantial, especially for students who receive the maximum payments. There is also strong evidence that the gender gap has decreased, as male participation in schools has increased. Lastly, this program is more efficient among children with poorer socio-economic backgrounds and slightly more significant if the payments were made directly to the child, rather than the parent. This research indicates that a subsidy to low income children to foster their education is an important variable in explaining graduation rates.

Vartanian (1999) discusses neighborhood conditions in both black and white communities and their impact on high school completion. He tests what characteristics influence high school drop out rates, such as growing up with wealthier neighbors, two parent households, the degree of parental education and employment level, and if these neighborhood conditions are more apparent in high school or college performance. Vartanian argues that, "if neighborhood issues are important, then policies that focus solely on developing individuals' skills without dealing with his or her surroundings are unlikely to be completely successful in reducing high school dropout rates (Vartanian, 1999)."

Vartanian offers four theoretical models that explain the significance of neighborhoods and how they relate to a high school's dropout rate. Isolation theory asserts that the negative effects of living 'socially isolated' are most severe in children without family supports to offset the effects of poor neighborhoods. Epidemic theory predicts that neighborhood quality will have little effect on education until it reaches 'epidemic levels,' stronger at low levels of neighborhood quality. Cultural deprivation theory suggests that high neighborhood quality can have a negative effect on children that are classified as "disadvantaged" in wealthier neighborhoods, resulting in a deviant subculture. Utility maximization theory states that all students are rational and choose to maximize their utility by weighing the costs and benefits of additional education.

Vartanian's empirical analysis finds that the poverty rate, the percent of female headed households, and the percent of professional and managerial occupations held by student's parents are statistically significant in measuring the dropout rate of high schools. Separating his findings into subgroups of blacks and whites, he finds that family income in the lowest third is significant for blacks in decreasing high school dropout rates, while family income in the highest third is significant for whites in increasing college graduation rates. Also, having a household head who is a dropout significantly lowers black students' graduation rates, while having a college educated household head significantly raises the graduation rates of white students.

Vartanian's paper focuses on the differences between blacks and whites and their neighborhood conditions on a socio-economic level. Analyzing the social relations between the student, family role models, and other peer students, Vartanian focuses primarily on family structure, parent's education, and income distribution within the neighborhood. As this paper is almost ten years old, I plan to reexamine Vartanian's variables influencing high school graduation rates, primarily differentials in race and income or poverty. Also, this paper will focus on high school graduation rates only and will focus precisely on the Metro-Detroit area, generating conclusions more relevant to our own community.

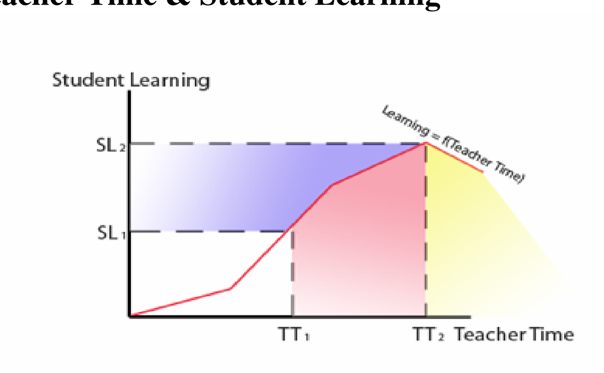
III. Economic Theory

The graduation rate for high school students can be impacted by many different variables, ranging from the poverty level of the neighborhood, to overall size of the class, and even to a student's family stability in the household. Economic theory will explain how each of these independent variables will affect the graduation rate of high school students. The factors that I think are significant in influencing high school graduation rates are: one-on-one teacher time with students, racial and gender make up of the student body, students from a divorced family, crime, poverty, the amount of funding going towards students in the schools, and students' performance on standardized tests. In this section, I will explain, in theory, how each variable would affect high school graduation rates differently.

Teachers are an important part of a student's education and their time and ability to focus their energy and concentration towards students is limited. In schools that have larger class sizes or greater student per teacher ratios, the less of a focused, attentive education students will receive. This reduced attention will be reflected in the student's grades as they perceive themselves to be less important or relevant to the class dynamic. These poor grades will create indifference in the student's education, decreasing the likelihood of the student to graduate.

A teacher's ability to spend individual time with students is limited inside the classroom. Teachers do not have unlimited time to properly attend to each student nor does the school have an endless budget to support increased working hours of teachers or hiring of more teachers. As the number of students increases or the number of teachers decreases, students are left with less one-on-one time with their teachers. This reduces the quality of instruction offered to students by the school. As stated earlier, a decrease in time spent with teachers at the school will essentially reflect a decrease in student's grades. This theory can be represented in a production function, where student learning is a function of several inputs, one of which is teacher time. As represented in Graph #1, a reduction in teacher time means reduction in output or student learning.

Graph #1: Teacher Time & Student Learning

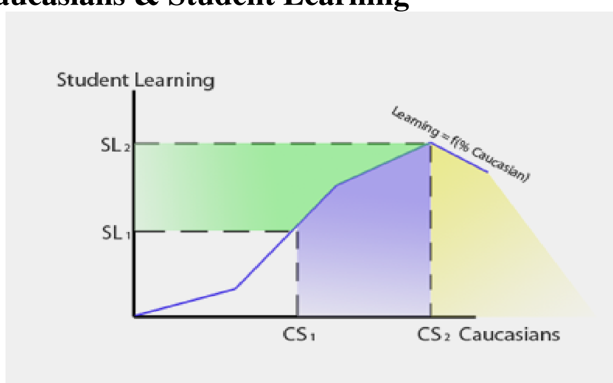


An increase in teachers, effectively increasing teacher's time, will increase the productivity of students learning to a certain point. Increasing teacher time up to but not exceeding point TT_2 is still beneficial to a student. Beyond this point, students are overwhelmed with the advice of their teachers and spend more time consulting with teachers than studying or learning.

Race and ethnicity can play a significant role in high school graduation. Minority races, in particular, face a greater risk of discrimination, poverty, crime, and violence. Discrimination can discourage students from working hard or studying. Living in a high crime or financially neglected neighborhood can add stressors and distractions to a student's life and education. Since Caucasians are the predominant race in the United States, we can infer that if a school's student body has a greater percentage of Caucasians, there would be less discrimination, poverty, crime, and have greater stability among students, weighed against multi-racial schools.

This increased stability would allow students to fully participate in school work, obtain better grades, and increase their likelihood of graduating from high school. This theory can be presented in a production function of several inputs, one of which is the percent of Caucasians students. As presented in Graph #2, an increase in Caucasians results in an increase in stability. A raise in stability equals an increase in student productivity or student learning.

Graph #2: Caucasians & Student Learning

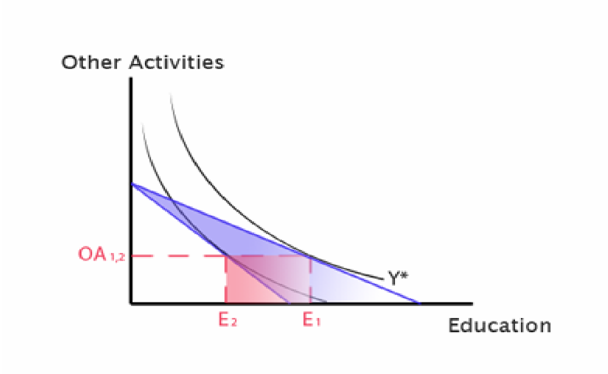


An increase in Caucasian students, effectively increasing stability in the school, will increase the productivity of students learning to a certain point. Increasing stability up to but not exceeding point CS_2 is still beneficial to a student. Beyond this point, students become complacent in their neighborhoods and schools. This can lead to false sense of security and merit, leading to poor study habits and mischief.

Divorce can play a crucial role in the development in a child's life. It can impact the way they socialize, their perception of the world, their ability to trust others and their level of comfort or support at home; in other words, their household stability. If a student is trying to cope with stressful changes caused by divorce at their home and is unable to put their full attention towards school, their grades and their ability to keep up with assignments will begin to lag and falter. This lag could eventually keep students behind a grade and could force students to dropout as the inconvenience of school is exceeded by the benefit of coping with and keeping a stable household.

Furthermore, the cost of schooling may rise due to an increase in traveling time between families, coping with added stress or childhood angst, and increased family responsibilities. This theory can be presented in a cost function of the number of years educated versus other family related activities. Graph #3 presents a budget line analysis of a representative high school student. An increase in the cost of attending school tilts the budget line inward, from BL_1 to BL_2. The student's new consumer optimum is at B with a lower quantity of education ($E_2 \leftarrow E_1$), holding all other costs constant. This results in a decline in the graduation rate of high school students.

Graph #3: Cost of Education & Divorce

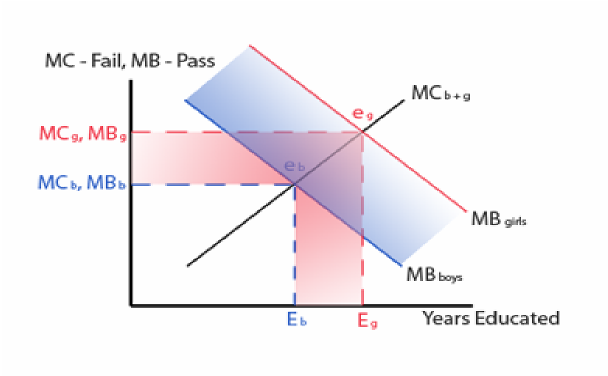


Women have had a long history of discrimination in the work place. Women, in general, are paid less than their male counterparts and have had to work and study above and beyond the average male worker just to be considered equal. A female student would recognize this discrimination towards their mother, aunt or another adult female figure and work harder to obtain better grades, as the benefits of succeeding far exceeds the costs of failing. Therefore, women students will strive to achieve higher grades and get accepted to better colleges, to compete against other men. Their ability to succeed later in life is highly dependent on graduating from high school.

A student's marginal benefit for more education results in a benefit curve that is sloping down as the number of years educated increases and as the benefit for each additional year decreases. So, the marginal benefit of a student decreases as the number of years educated increases as you move down the benefit curve. Marginal cost increases as the number of years educated increases for each additional year.

Female students have a greater marginal benefit to succeed, as the rest of their professional careers are carefully scrutinized by their performance in school. This extra care and work towards school will increase a female's benefit greater than that of her male counterpart. As presented in Graph #4, a positive shift outward in the marginal benefit of education will result in an increase in the number of years educated from E_b to E_g as well as the marginal cost of education. Assuming costs are the same for both genders, female students have a greater incentive to increase their level of education, therefore increasing their likelihood of graduating from high school.

Graph #4: Cost, Benefit of Education & Gender

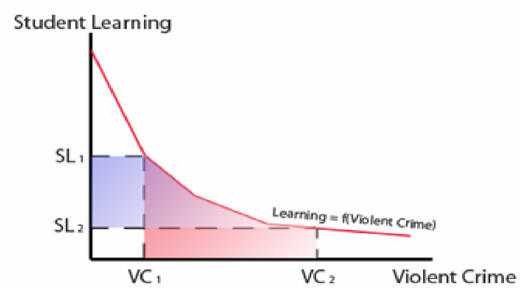


Essentially, this increase in marginal benefits for female students is to catch up to their male counterparts, as gender discrimination will offset a woman's ability to obtain higher pay and employment status. Women, in general, have to perform twice that of men, which entails twice the costs, just to get the same amount of credit. However, since a female's outcome of an increase in marginal benefit is equal to a male with no increase in education, the increase in benefit is better than the alternative of no further education.

Crime is apparent in any school, no matter how wealthy its residents or how well students perform on tests. Crime, in general, is part of human nature. However, violent crime can significantly alter the way a student acts in school, their neighborhood, and at home. Fear of being bullied, shot, or getting mugged on the way to or from school can have a profound negative impact on a student's opinion of school. If a student experiences or fears the possibility of being the victim of a violent crime, especially on or near school property, he/she will view school and education as a hostile environment and withdraw from participating in or even attending school.

Students living in areas of higher violent crime rates are more likely to withdraw from school-related activities that present the most potential for risk: school. This theory can be presented in a production function of several inputs, one of which is violent crime within the school district. As presented in Graph #5, an increase in violent crime results in a decrease in student productivity.

Graph #5: Violent Crime & Student Learning

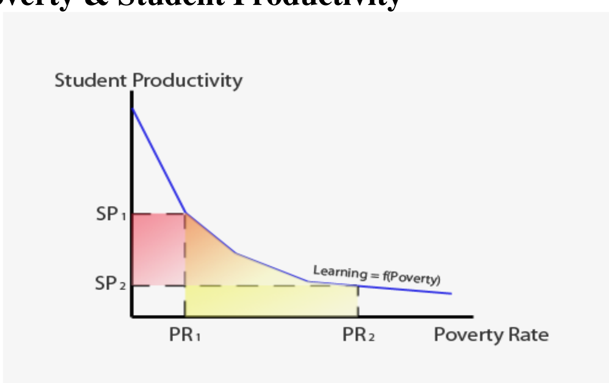


An increase in violent crime from VC_1 to VC_2 decreases the productivity of a student through adverse conditions at the student's school or community. Avoiding risk, a student's ability to learn or educated drops from SL_1 to SL_2. This decrease in education results in a decrease in the high school's graduation rate.

Poverty affects every race, gender, creed, age or location. However, minorities face a high risk of poverty, as women are more likely to be poorer than men and children are more likely than adults. It is a problem faced by everyone, from the people living within the derelict neighborhoods, to the businessman traveling to work, to surrounding cities impacted by the lowered property values and the higher crime rates associated with poverty. Poverty can affect a family's sensitivity to prices and costs of everyday activities and supplies. If a family has a choice of buying food for the week or buying school supplies for their children, the choice is obvious. Families unable to provide adequate support for their children's education will suffer as they are unable to function properly in class and unable to keep up with other students in the school.

Students living in poverty are more likely to value goods of necessity or immediate survival and be cost-averse to items perceived as ‘discretionary,’ such as school supplies, transportation to school, lunches, and related activities. A shortage of school supplies results in a decrease in productivity of the student, decreasing the likelihood of graduating from high school. Lack of food can impair a student’s ability to concentrate and negatively impact their cognitive development. This theory can be presented in a production function with several inputs, one of which is the level of poverty. As presented in Graph #6, an increase in poverty results in a decrease in student productivity.

Graph #6: Poverty & Student Productivity

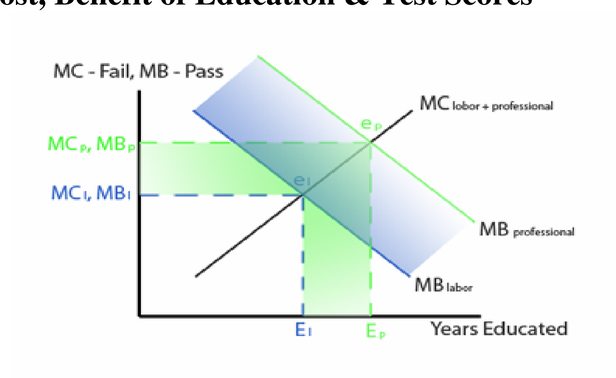


An increase in neighborhood poverty, effectively decreasing a student’s ability to function properly in the classroom, will decrease the productivity of student learning. Extreme poverty, in theory, could completely hinder a student’s ability to learn to a point where no amount of education is possible, such as homelessness.

Standardized tests, if implemented correctly, offer an indication of a student’s overall ability to learn, comprehension of material, and are prerequisites for admission to higher levels of education. Tests signify not only a student’s overall ability to learn but the quality of education a school offers their students. Poor performance on standardized tests can affect a student's likelihood of being accepted to a good college and their ability to obtain a job that pays more than minimum wage, is not physically intensive, or is not considered an undesirable profession.

Student's who want to succeed in their academic and professional careers have a greater marginal benefit to excel in their standardized test scores than students that have given up hope of a successful long term future. As represented in Graph #7, a positive shift outward in the marginal benefit of education will result in an increase in the number of years educated as well as the marginal cost of education. The more students believe they will have the opportunity to go to college and then obtain better jobs, the higher the perceived marginal benefit of graduating from high school. So, students will work harder to obtain higher MEAP test scores and therefore, increase their likelihood of graduating from high school.

Graph #7: Cost, Benefit of Education & Test Scores



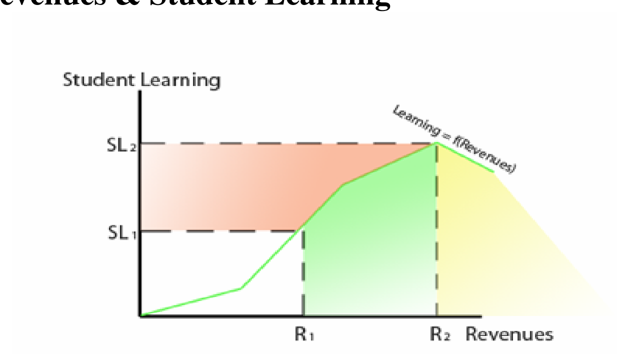
This increase in marginal benefits for students pursuing higher test scores, to ensure a better future and career, will result in an increase in the number of years educated, as professional career employers require better grades and scores to differentiate themselves from other less qualified workers. As a result, students require a greater number of years educated, increasing the likelihood of the student to graduate from high school.

Revenues play an import role for a company or organization to function properly and to become successful. Revenues are a sign of health, stability and growth within the company.

Public school revenues come from the property taxes, or millage, from the city's residents, signifying not only the health and stability of the neighborhood, but the perceived value school holds in the residents of the surrounding neighborhoods. Without properly funded schools, a student's ability to learn is impeded by derelict, hazardous facilities, inadequate school supplies, and the lack of extra-curricular activities.

An increase in revenues would create an environment beneficial to student learning. This increase would allow students to fully participate in school work, obtain better grades, and increase their likelihood of graduating from high school. This theory can be presented in a production function of several inputs, one of which is the amount of revenue set aside per student. As represented in Graph #8, an increase in revenue results in an increase in student productivity or student learning.

Graph #8: Revenues & Student Learning



An increase in revenues will increase the productivity of a student's learning to a certain point. Increasing stability up to but not exceeding point R_2 is still beneficial to a student. Beyond this point, students become too wide spread and are unable to fully concentrate on their school work. This can lead to a reduction in student productivity, effectively reducing their grades and likelihood of graduating from high school.

The equation below represents my theory. If this is correct, then Teachers, Caucasians, Females, Standardized Tests, and Revenues would have a positive impact on the graduation rate for public high school students, on average. Divorce, Violent Crime, and Poverty would have a negative impact on the graduation rate for public high school students, on average.

$$\mathbf{Grad = \beta_1 + \beta_2 Teachers + \beta_3 Caucasians - \beta_4 Divorce + \beta_5 Females}$$

$$\mathbf{- \beta_6 VCrime - \beta_7 Poverty + \beta_8 Tests + \beta_9 Revenues + U_i}$$

IV. Econometric Model

Applying the theory presented, this model will include variables I believe will have a significant impact on the public high school graduation rates for students in the Metropolitan Detroit area. Given the scope and time constraints of this project, I have limited the number of variables to what was feasible to obtain in the given time. All schools were picked on the basis of central location around the Metro Detroit area, specifically a twenty mile radius from the 48230 zip code, including forty school districts and over seventy individual high schools. All schools that are neither magnet nor charter schools are considered "regular" public schools.

The independent variables include: the average student to teacher ratio, the percentage of students who are white; the percentage of students who are female; the percentage of students receiving free lunches at school; local revenue going towards the students; the violent crime rate of the city; and the percentage of students successfully passing the MEAP math and science tests. All independent variables are quantitative and continuous, using school district and city data from the CCD and FBI. Appendix A presents the sources and descriptive statistics for all the variables used in this study.

The high school graduation rate in Michigan, the dependent variable, is determined by the Department of Education's Center for Educational Performance and Information (CEPI) yearly report, Michigan Graduation / Dropout Rates. This rate represents the percent of students who graduated at the end of grade 12 in the spring of 2006, excluding students that dropped out of school or obtained a certificate of completion or a General Equivalency Diploma (GED). Based on the data collected, biases may occur due to the double counting of students held back in 9th grade that go into the graduation rate of schools four years later. However in light of NCLB, this bias has decreased as schools are more inclined to graduate students to the next grade in order to keep state and federal funding. The descriptive statistics for the high school graduation rate (Grad) are:

	N	Minimum	Maximum	Mean	Std. Deviation
Grad	40	.5484	.9915	.877603	.1130667

Troy School District had the highest high school graduation rate of 99.15% and Highland Park City Schools had the lowest high school graduation rate of 54.84%. There was a difference of 44.31 percentage points.

The variable "Teacher" refers to the number of students per teacher, which is the total number of students enrolled in public high school divided by the total number of teachers at that school for the school year 2005/06. This value per school is then averaged among the other schools in that district to obtain a representative value for the district. Values are represented in the number of students. The descriptive statistics for Teacher are:

	N	Minimum	Maximum	Mean	Std. Deviation
Teacher	40	16.7	24.7	20.298	1.8955

Ecorse Public School District had the lowest student to teacher ratio (16.7) while Westland Community Schools had the highest student to teacher ratio (24.7).

"White" refers to the percentage of students enrolled in public high school that are considered Caucasian, or white, for the school year 2005/6. This value per school is then averaged among the other schools in that district to obtain a representative value for the district. Values are represented in percentages, not number of students. The descriptive statistics for White are:

	N	Minimum	Maximum	Mean	Std. Deviation
White	40	.0046	.9517	.664658	.2932748

Wyandotte City School District had the highest white student enrollment (95.17%) and Highland Park City Schools had the lowest white student enrollment (0.46%).

"Female" refers to the percentage of students enrolled in high school that are considered female in gender for the school year 2005/6. This value per school is then averaged among the other schools in the district to obtain a representative value for the district. Values are represented in percentages, not number of students. The descriptive statistics for Female are:

	N	Minimum	Maximum	Mean	Std. Deviation
Female	40	.4275	.5245	.489146	.0222691

Lakeview Public Schools had the highest female student enrollment (52.45%) and Hamtramck Public Schools had the lowest female student enrollment (42.75%).

"Free Lunch Rate" refers to the percentage of students enrolled in high school that are eligible to receive free lunches at school for the school year 2005/6. This value per school is then averaged among the other schools in the district to obtain a representative value for the district. Values are represented in percentages, not number of students. This variable acts as a proxy to determine the school district's level of poverty. The descriptive statistics for Free Lunch Rate are:

	N	Minimum	Maximum	Mean	Std. Deviation
Free_Lunch_Rate	40	.0245	.8932	.278839	.2111611

Mt. Clemens Community School District had the highest free lunch rate (89.32%) and Troy School District had the lowest free lunch rate (2.45%).

"Local Rev" refers to the amount of revenue given to the district at the local level per student enrolled in that district for the school year 2005/6. This value is represented in nominal U.S. dollars and excludes revenues generated from the state and federal governments. The descriptive statistics for Local Rev are:

	N	Minimum	Maximum	Mean	Std. Deviation
Local_Rev	40	989	9820	3621.65	1868.224

Lamphere Public Schools had the highest amount of local revenue ($9,820) and Highland Park City Schools had the lowest amount of local revenue ($989). There is a range of $8,831 in local revenue.

"VCrime Rate" refers to the percentage of violent crimes reported to the FBI for the school district's city for the year 2006. Violent crimes as defined by the FBI are murder, rape, and battery. Note that the FBI reports crime data on the city level only and some school districts are within the same city limits. Values are represented in percentages, not the number of crimes, in the city. The descriptive statistics for VCrime Rate are:

	N	Minimum	Maximum	Mean	Std. Deviation
vcrime_rate	40	.0006	.0242	.005315	.0052443

Detroit City School District had the highest violent crime rate (2.42%) and Clawson City School District had the lowest (0.06%).

"MEAP Math Sci" refers to the percentage of students enrolled in public school districts that have met or exceeded the MEAP standards for math and science subjects for the class of 2006. This percentage excludes testing done in reading, writing, and social studies, as I believe that these subjects are standard basic skills necessary to function in a class room setting. Math and Science efficiency demonstrates greater skill to succeed beyond the high school level. Values are represented in percentages, not the number of students. The descriptive statistics for MEAP Math Sci are:

	N	Minimum	Maximum	Mean	Std. Deviation
MEAP_math_sci	40	.0400	.7775	.416725	.1614550

Grosse Pointe Public Schools had the highest percent of students passing MEAP tests (77.75%) and Highland Park City Schools had the lowest (4.0%), a 73.75 percentage point difference.

The equation below represents the econometric model, which predicts that Teacher, White, Female Local Rev and MEAP variables will have a positive impact on public high school graduation rates, on average. If my theory is correct, then Free Lunch and VCrime will have a negative impact on the graduation rate for public high schools in the Metropolitan Detroit area for the school year 2006, on average.

$$\mathbf{Grad = b_1 + b_2Teacher + b_3White + b_4Female - b_5FreeLunch}$$

$$\mathbf{+ b_6LocalRev - b_7VCrime + b_8MEAP + e_i}$$

V. Results

The econometric equation presented above is estimated using Ordinary Least Squares regression (OLS). OLS regression produces an estimate of the population regression function by selecting a line that minimizes the sum of squared distances between the sample regression function and sample observations. The equation below represents the estimated value for high school graduation rates and the influences each independent variable has on high school graduation rates, on average.

$$\hat{Y}_i = 1.30 + .003Teacher_i - .067White_i - .646Female_i - .395FreeLunch_i - 3.943E-6Localrev_i - 7.005Vcrime_i + .087MEAPmathsci_i$$

se =	**(0.322)**	**(0.006)**	**(0.049)**	**(0.471)**	**(0.082)**	**(0.000)**	**(2.545)**	**(0.093)**
t =	**(4.043)**	**(0.511)**	**(-1.374)**	**(-1.373)**	**(-4.843)**	**(-0.648)**	**(-2.753)**	**(0.943)**
sig =	**(0.000)**	**(0.613)**	**(0.179)**	**(0.179)**	**(0.000)**	**(0.521)**	**(0.010)**	**(0.353)**

d.f. = 32 **r^2 = 0.785** **Adjusted r^2 = 0.738**

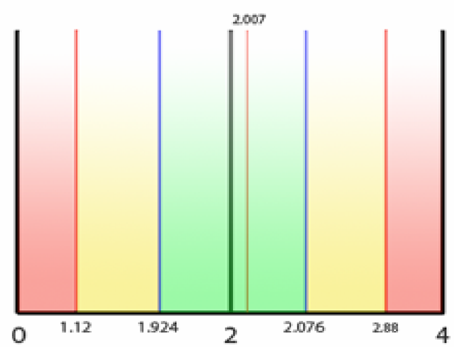
If all of the necessary conditions hold, the OLS estimators are BLUE: Best, Linear, Unbiased, Estimator. Best indicates the estimator with the lowest variance and is considered reliable. Linear indicates the estimator is linear in all the variables. Unbiased estimators produce the correct value on average. Estimator refers to the formula applied to the sample to get the point estimate. Multicollinearity, autocorrelation, and heteroscedasticity violate the assumptions needed for the OLS estimators to be BLUE.

The regression output shows no immediate signs of Classical Limit Regression Model (CLRM) assumption violations (Appendix B). Since the sample is sufficiently large, we are confident that the disturbance term is normally distributed based on the Central Limit Theorem. We can conduct hypothesis testing based on this assumption that: $U_i \sim N$

Examining the Variance Inflation Factors (VIF) to determine any significant multicollinearity between the independent variables, we find no sufficient cause to conclude that the regression suffers from multicollinearity. Since the largest VIF value is 3.458, for the Free Lunch Rate variable, is less than 10, we can conclude that there is some collinearity, but it is not statistically significant: $COR(X_i, X_j) = 0 \quad \forall_{i \neq j}$

Since the data collected in this model are cross sectional data and not time series, autocorrelation violation is probably not an issue. However, to ensure a complete and accurate analysis of this model, the Durbin-Watson statistic of 2.007 is tested. H_0, null hypothesis, indicates that there is no presence of autocorrelation and H_1, alternative hypothesis, indicates a presence of autocorrelation.

$H_0 : \rho = 0 \quad H_1 : \rho \neq 0 \quad d_l = 1.12 < d_u = 1.924 < \mathbf{2.007} > 4\text{-}d_u = 2.076 > 4\text{-}d_l = 2.88$



Since the statistic is essentially 2, which indicates no autocorrelation, this test indicates no autocorrelation: we conclude at the %5 level that: $COR(U_i, U_j) = 0 \quad \forall_{i \neq j}$

Next, I checked to see if the error term is homoscedastic. The presence of heteroscedasticity causes biased estimates of the standard errors, making hypothesis testing invalid. Using each of the continuous independent variables, I graphed the variables against the residuals squared. These graphs look somewhat suspicious, indicating possible heteroscedasticity in the model (Appendix C). To determine formally whether the residuals were homoscedastic, I conducted Park Tests for all relevant, continuous, independent variables. Park

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Tests determines the statistical significance of the variance of the error term as it varies from observation to observation. H_0 indicates that there is no presence of heteroscedasticity and H_1 indicates the presence of heteroscedasticity. $VAR(U_i) = \sigma^2 \quad \forall_i$

As shown in Appendix C (Teacher Park Test), running a regression of the natural log of the residuals squared as the dependent variable and the natural log of Teacher as the independent variable, we can see that the slope for lnTeacher is -1.689. This could indicate heteroscedasticity. Running a hypothesis test, we can check to see if the slope of lnTeacher is statistically significant to cause a model assumption violation.

$H_0 : \beta_2 = 0 \quad H_1 : \beta_2 \neq 0$ t-stat = -0.529 p-value = 0.60 > 0.10 > 0.05 > 0.01

Since the observed p-value is greater than 10%, we can accept the null hypothesis that the slope for lnTeacher is not statistically significant at the standard weak alpha level of 10%. There is no evidence supporting the possibility of heteroscedasticity.

Running a regression of the natural log of the residuals squared as the dependent variable and the natural log of White as the independent variable, we can see that the slope for lnWhite is 0.107. Running a hypothesis test, we can check to see if the slope of lnWhite is statistically significant to cause a model assumption violation.

$H_0 : \beta_2 = 0 \quad H_1 : \beta_2 \neq 0$ t-stat = 0.430 p-value = 0.67 > 0.10 > 0.05 > 0.01

Again, the p-value exceeds 10%, so we can accept the null hypothesis that the slope for lnWhite is not statistically significant. There is no evidence supporting the possibility of heteroscedasticity.

Running a regression of the natural log of the residuals squared as the dependent variable and the natural log of Female as the independent variable, we can see that the slope for lnFemale is 3.765. This could indicate heteroscedasticity. We conduct a hypothesis test of the slope of lnFemale to see if heteroscedasticity is present:

$$H_0 : \beta_2 = 0 \qquad H_1 : \beta_2 \neq 0 \qquad \text{t-stat} = 0.593 \quad \text{p-value} = 0.557 > 0.10 > 0.05 > 0.01$$

Because the p-value exceeds 10%, we can accept the null hypothesis that the slope for lnFemale is not statistically significant at the standard weak alpha level of 10%. There is no evidence supporting the possibility of heteroscedasticity.

Repeating this process using the natural log of Free Lunch Rate, we can see that the slope for lnFreeLunchRate is 0.304. The hypothesis test for the slope of lnFreeLunchRate is:

$$H_0 : \beta_2 = 0 \qquad H_1 : \beta_2 \neq 0 \qquad \text{t-stat} = 0.853 \quad \text{p-value} = 0.399 > 0.10 > 0.05 > 0.01$$

We can accept the null hypothesis that the slope for lnFreeLunchRate is not statistically significant at the standard weak alpha level of 10%. There is no evidence supporting the possibility of heteroscedasticity.

Running a regression of the natural log of the residuals squared as the dependent variable and the natural log of Local Rev as the independent variable, we can see that the slope for lnLocalRev is 0.541. We conduct a hypothesis test of the slope of lnLocalRev to see if heteroscedasticity is present:

$$H_0 : \beta_2 = 0 \qquad H_1 : \beta_2 \neq 0 \qquad \text{t-stat} = 0.92 \quad \text{p-value} = 0.363 > 0.10 > 0.05 > 0.01$$

Because the p-value exceeds 10%, we can accept the null hypothesis that the slope for lnLocalRev is not statistically significant at the standard weak alpha level of 10%. There is no evidence supporting the possibility of heteroscedasticity.

Running a regression of the natural log of the residuals squared as the dependent variable and the natural log of VCrime as the independent variable, we can see that the slope for lnVCrime is 0.032. We conduct a hypothesis test of the slope of lnVCrime to see if heteroscedasticity is present:

$$H_0 : \beta_2 = 0 \quad H_1 : \beta_2 \neq 0 \quad \text{t-stat} = 0.086 \quad \text{p-value} = 0.932 > 0.10 > 0.05 > 0.01$$

Since the observed p-value is greater than 10%, we can accept the null hypothesis that the slope for lnVCrime is not statistically significant at the standard weak alpha level of 10%. There is no evidence supporting the possibility of heteroscedasticity.

Repeating this process using the natural log of MEAPMathSci, we can see that the slope for lnMEAPMathSci is -0.304. The hypothesis test for the slope of lnMEAPMathSci is:

$$H_0 : \beta_2 = 0 \quad H_1 : \beta_2 \neq 0 \quad \text{t-stat} = -0.58 \quad \text{p-value} = 0.565 > 0.10 > 0.05 > 0.01$$

We can accept the null hypothesis that the slope for lnMEAPMathSci is not statistically significant at the standard weak alpha level of 10%. There is no evidence supporting the possibility of heteroscedasticity.

Measurement error is a possibility within the model as the violent crime rates reflect only crimes reported to the FBI and not the actual number of crimes within the city. Crime statistics are usually under reported and, even though this is a concern, I believe that there is no better alternative to collecting crime statistics than through the FBI. Collecting independent crime data is too costly and time consuming and beyond the scope of this paper.

The graduation rates reported by CEPI and the CCD could be biased due to the double counting of students held back in previous high school grades, 9^{th} through 12^{th} grade, that go into the graduation rate of schools four years later. Collecting data from the U.S. Census Bureau is an alternative, as they record actual household graduation data in the area. However, the data are only available for 2000. With the introduction of NCLB Act of 2002, I believe the bias has diminished as schools are more inclined to graduate students to the next grade. This creates a more precise estimate of high school graduation rates and the possibility of measurement error is limited.

Finally, there is no evidence that the data collected for this econometric model is violating any of the CLRM assumptions needed for a BLUE model. There is no statistically significant collinearity, auto-correlation, or heteroscedasticity between the variables and the disturbance terms. Measurement error is limited and there is no need to re-run the regression and we can now start hypothesis testing for levels of significance of the model and its independent variables.

As shown in Appendix B (Regression Output), the regression explains 73.8% of the variance in the high school graduation rate. We conduct a hypothesis test to ensure statistical significance, and to see if the regression actually explains 73.8% of the variance in high school graduation rates:

$$H_0 : \overline{R}^2 = 0 \qquad H_1 : \overline{R}^2 > 0 \qquad \text{F-stat} = 16.7 \quad \text{p-value} = 0.00 < 0.01 < 0.05 < 0.10$$

We reject the null hypothesis and conclude that there is a 0% chance to observe an adjusted R^2 of 73.8% if the population's adjusted R^2 is equal to zero. This regression is statistically significant at the 1% level and the regression explains 73.8% of the variance in high school graduation rates. This regression works very well.

Examining "Teacher," we can see the slope is 0.003, meaning that for every additional student per teacher, there is a 0.003 percentage point increase in the high school graduation rate, on average, ceteris paribus. We conduct a hypothesis test of the slope of Teacher to determine statistical significance of a linear association between Teacher and Grad:

$$H_0 : \beta_2 = 0 \qquad H_1 : \beta_2 \neq 0 \qquad \text{t-stat} = 0.511 \quad \text{p-value} = 0.613 > 0.10 > 0.05 > 0.01$$

We accept the null hypothesis and conclude that there is no evidence of a linear association between the teacher to student ratio and the high school graduation rate at the 10% level of significance.

To test our theory, we will conduct a hypothesis test for a statistically significant positive linear relationship between the two variables:

$H_0 : \beta_2 \leq 0 \quad H_1 : \beta_2 > 0$ t-stat = 0.511 p-value = 0.613/2 = 0.3065 > 0.10

We accept the null hypothesis and conclude that there is no evidence to support the theory that there is a positive association between the teacher to student ratio and the high school graduation rate at the 10% level.

Examining "White," we can see that the slope is -0.067, meaning that for every one percentage point increase in percent of white students, there is a 0.067 percentage point decrease in the high school graduation rate, on average, ceteris paribus. We conduct a hypothesis test of the slope of White to determine statistical significance of a linear association between White and Grad:

$H_0 : \beta_3 = 0 \quad H_1 : \beta_3 \neq 0$ t-stat = -1.374 p-value = 0.179 > 0.10 > 0.05 > 0.01

We accept the null hypothesis and conclude that there is no evidence of a linear association between the percentage of white students and the high school graduation rate at the 10% level. Due to the negative slope of the White variable, we suspect the theory is incorrect and we will conduct a hypothesis test for a statistically significant negative linear relationship between the two variables:

$H_0 : \beta_3 \geq 0 \quad H_1 : \beta_3 < 0$ t-stat = -1.374 p-value = 0.179/2 = 0.0895 < 0.10, > 0.05

We reject the null hypothesis, concluding that there is evidence to contradict the theory and there is a weak negative association between the percentage of white students and the high school graduation rate at the 10% level.

The slope for "Female" is -0.646, meaning that for every one percentage point increase in female students enrolled in high school, there is a 0.646 percentage point decrease in the high school graduation rate, on average, ceteris paribus. We conduct a hypothesis test of the slope of Female to determine statistical significance of a linear association between Female and Grad:

$H_0 : \beta_4 = 0 \quad H_1 : \beta_4 \neq 0$ t-stat = -1.373 p-value = 0.179 > 0.10 > 0.05 > 0.01

We accept the null hypothesis and conclude that there is no evidence of a linear association between the percentage of female students and the high school graduation rate at the 10% level. Due to the negative slope of the Female variable, we suspect the theory is incorrect and we will conduct a hypothesis test for a statistically significant negative linear relationship between the two variables:

$H_0 : \beta_4 \geq 0 \quad H_1 : \beta_4 < 0$ t-stat = -1.373 p-value = 0.179/2 = 0.0895 < 0.10, > 0.05

We reject the null hypothesis and applied theory, concluding that there is evidence to contradict the theory, there is a weak negative association between the percentage of female students and the high school graduation rate at the 10% level.

The "Free Lunch Rate" slope is -0.395, meaning that for every one percentage point increase in students eligible for free lunch, there is a 0.395 percentage point decrease in the high school graduation rate, on average, ceteris paribus. We conduct a hypothesis test of the slope of Free Lunch Rate to determine statistical significance of a linear association between Free Lunch Rate and Grad:

$H_0 : \beta_5 = 0 \quad H_1 : \beta_5 \neq 0$ t-stat = -4.843 p-value = 0.00 < 0.01 < 0.05 < 0.10

We reject the null hypothesis and conclude that there is strong evidence of a linear association between the percentage of students eligible for a free lunch and the high school graduation rate at the 1% level. To test our theory, we will conduct a hypothesis test for a statistically significant negative linear relationship between the two variables:

$$H_0 : \beta_5 \geq 0 \quad H_1 : \beta_5 < 0 \quad \text{t-stat} = -4.843 \ \text{p-value} = 0.00/2 = 0.00 < 0.01$$

We reject the null hypothesis and conclude that there is evidence of a strong negative association between the percentage of students eligible for a free lunch and the high school graduation rate at the 1% level. This supports the theory.

Examining "Local Rev,' we can see that the slope is -3.943E-6, meaning that for every one dollar increase in local revenue per student, there is a negative 3.943E-6 percentage point decrease in the high school graduation rate, on average, ceteris paribus. We conduct a hypothesis test of the slope of Local Rev to determine statistical significance of a linear association between Local Rev and Grad:

$$H_0 : \beta_6 = 0 \quad H_1 : \beta_6 \neq 0 \quad \text{t-stat} = -0.648 \ \text{p-value} = 0.521 > 0.10 > 0.05 > 0.01$$

We accept the null hypothesis and conclude that there is no evidence of a linear association between the amount of local revenue per student and the high school graduation rate at the 10% level. Due to the negative slope of the Local Rev variable, we suspect the theory is incorrect and we will conduct a hypothesis test for a statistically significant negative linear relationship between the two variables:

$$H_0 : \beta_6 \geq 0 \quad H_1 : \beta_6 < 0 \quad \text{t-stat} = -0.648 \ \text{p-value} = 0.521/2 = 0.2605 > 0.10$$

We accept the null hypothesis, concluding that there is no evidence of negative association between the amount of local revenue per student and the high school graduation rate at the 10% level.

The slope of "VCrime Rate" is -7.005, meaning that for every one percentage point increase in the city's violent crime rate, there is a 7.005 percentage point decrease in the high school graduation rate, on average, ceteris paribus. We conduct a hypothesis test of the slope of VCrime to determine statistical significance of a linear association between VCrime Rate and Grad:

$$H_0 : \beta_7 = 0 \qquad H_1 : \beta_7 \neq 0 \qquad \text{t-stat} = -2.753 \;\; \text{p-value} = 0.01 = 0.01 < 0.05 < 0.10$$

We reject the null hypothesis and conclude that there is strong evidence of a linear association between the violent crime rate of the city and the high school graduation rate at the 1% level. To test the theory, we will conduct a hypothesis test for a statistically significant negative linear relationship between the two variables:

$$H_0 : \beta_7 \geq 0 \qquad H_1 : \beta_7 < 0 \qquad \text{t-stat} = -2.753 \;\; \text{p-value} = 0.01/2 = 0.005 < 0.01$$

We reject the null hypothesis and conclude that there is evidence of a strong negative association between the violent crime rate of the city and the high school graduation rate at the 1% level. This result supports the theoretical model.

Examining "MEAP Math Sci," we can see that the slope is 0.087, meaning that for every one percentage point increase in students meeting or exceeding the MEAP standards for math and science, there is a 0.087 percentage point increase in the high school graduation rate, on average, ceteris paribus. We conduct a hypothesis test of the slope of MEAP Math Sci to determine statistical significance of a linear association between MEAP Math Sci and Grad:

$$H_0 : \beta_8 = 0 \qquad H_1 : \beta_8 \neq 0 \qquad \text{t-stat} = 0.943 \;\; \text{p-value} = 0.353 > 0.10 > 0.05 > 0.01$$

We accept the null hypothesis and conclude that there is no evidence of a linear association between the percent of students meeting or exceeding the MEAP standards for math and science and the high school graduation rate at the 10% level. To test our theory, we will conduct a hypothesis test for a statistically significant positive linear relationship between the two variables:

$$H_0 : \beta_8 \leq 0 \qquad H_1 : \beta_8 > 0 \qquad \text{t-stat} = 0.943 \text{ p-value} = 0.353/2 = 0.1765 > 0.10$$

We accept the null hypothesis and conclude that there is no evidence of a positive association between the percent of students meeting or exceeding the MEAP standards for math and science and the high school graduation rate at the 10% level.

VI. Summary & Conclusions

This paper has created a theoretical economic model explaining the differences in graduation rates in high schools across school districts in the Metropolitan Detroit area. This theory was then estimated using SPSS and Ordinary Least Squares (OLS) regression. Even though this econometric model explains 73.8% of the variance in high school graduation rates, it is surprising to find that most of the independent variables (Teacher, Local Rev, and MEAP Math Sci) have no statistically significant effect on high school graduation rates. However, the percent of white students and the percent of female students have a statistically weak negative association with average graduation rates. These results contradict the model. The only variables in this model that are statistically significant and bear the predicted signs were VCrime Rate and Free Lunch Rate, which is a proxy for poverty in the surrounding area. School districts with more crime and poverty have lower average graduation rates. These results are consistent with the hypothesis that crime and poverty pose serious threats to children's educational attainment.

With these results, policy makers could effectively implement new policies precisely targeting violence and poverty in high schools and in their surrounding neighborhoods. This change in policy could also avoid certain pitfalls of allocating time and resources into certain variables that have no effect on the graduation rate, such as increasing the number of teachers in a class room, or increasing local millages directed towards students in schools.

This study also addresses the relevance of standardized tests in our schools, in particular, the Michigan Educational Assessment Program (MEAP). In this econometric model, there is no significant correlation between high school graduation rates and students passing the MEAP math and science tests. One could infer that the ability or importance to pass the MEAP tests is irrelevant to graduating high school or that high schools do not base student performance on materials covered in the MEAP math and science sections. This could also present an underlying social problem concerning our youth's attitude towards math and science disciplines that cannot be measured easily and is beyond the scope of this paper.

The theoretical implication that females would benefit more than men in continuing their education and therefore, increasing high school graduation rates, has weak statistical evidence proving otherwise in the econometric model. Perhaps an underlying factor of discrimination or peer pressure to conform to the standard of a less intimidating female figure is responsible for this weak negative relationship between the percentage of female students and high school graduation rates. This is a limitation of the model, as measuring for social norms and unreported discrimination is beyond the scope of this paper.

Even though this model explains a significant portion of the variance in high school graduation rates, the model is limited due to its limited scope or extreme microeconomic area studied. Certain factors, such as divorce rates, are recorded only at the county level, not by the city or school district. This not only excludes a theoretically relevant variable, but limits the econometric model from fully explaining the variance in high school graduation rates.

With the high school graduation rate in Detroit plummeting below 50% this year, it is imperative that politicians, communities and families completely understand the problems that are faced by our public high schools. Education is the key to future productivity, as the students of today will pave the way to our economy's future. In order to stabilize and ensure a strong, productive future economy for Detroit and the rest of Michigan, we must educate our high school students by minimizing the effects of violent crime and poverty on our community.

Appendix A: Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Grad	40	.5484	.9915	.877603	.1130667
Teacher	40	16.7	24.7	20.298	1.8955
White	40	.0046	.9517	.664658	.2932748
Female	40	.4275	.5245	.489146	.0222691
Free_Lunch_Rate	40	.0245	.8932	.278839	.2111611
Local_Rev	40	989	9820	3621.65	1868.224
vcrime_rate	40	.0006	.0242	.005315	.0052443
MEAP_math_sci	40	.0400	.7775	.416725	.1614550

Graduation rates for public high schools came from Michigan's Department of Education, Center for Educational Performance and Information. A yearly report called "Public Student Graduation/Dropout Data & Reports" found at www.michigan.gom/cepi/0,1607,7-113-21423_30451_30463---,00.html

Teacher ratio, White, Female and Free Lunch Rate rates for public high schools came from the National Center for Education Statistics, Common Core of Data, Public Schools found at nces.edu.gov/ccd/schoolsearch and Local Rev rates found at nces.edu.gov.ccd/districtsearch under Fiscal data.

VCrime Rate for cities came from the Federal Bureau of Investigation, Crime in the United States, Offenses Known to Law Enforcement Table 8 for Michigan in 2006 found at www.fbi.gov/ucr/cius2006/data/table_08_mi.html

MEAP Math Sci rates for public high schools came from Michigan's Department of Education, Michigan Education Assessment Program found at www.michigan.gov/mde/0,1607,7-140-22709_31168_31530---,00.html

Appendix B: Regression Output

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.886[a]	.785	.738	.0578661	2.007

a. Predictors: (Constant), MEAP_math_sci, Female, Teacher, Local_Rev, vcrime_rate, White, Free_Lunch_Rate

b. Dependent Variable: Grad

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.391	7	.056	16.700	.000[a]
	Residual	.107	32	.003		
	Total	.499	39			

a. Predictors: (Constant), MEAP_math_sci, Female, Teacher, Local_Rev, vcrime_rate, White, Free_Lunch_Rate

b. Dependent Variable: Grad

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.300	.322		4.043	.000		
	Teacher	.003	.006	.052	.511	.613	.641	1.559
	White	-.067	.049	-.174	-1.374	.179	.418	2.391
	Female	-.646	.471	-.127	-1.373	.179	.781	1.280
	Free_Lunch_Rate	-.395	.082	-.738	-4.843	.000	.289	3.458
	Local_Rev	-3.943E-6	.000	-.065	-.648	.521	.665	1.504
	Vcrime_rate	-7.005	2.545	-.325	-2.753	.010	.482	2.074
	MEAP_math_sci	.087	.093	.125	.943	.353	.384	2.604

a. Dependent Variable: Grad

Appendix C: Park Tests

Teacher Park Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.085[a]	.007	-.019	1.84856

a. Predictors: (Constant), lnTeacher

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.956	1	.956	.280	.600[a]
	Residual	129.853	38	3.417		
	Total	130.809	39			

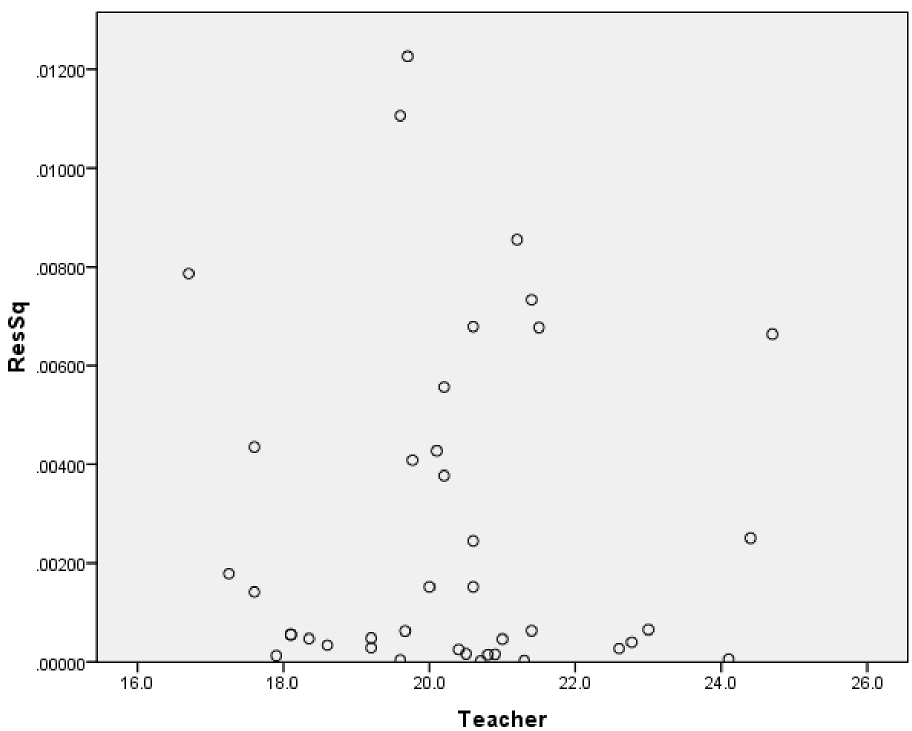
a. Predictors: (Constant), lnTeacher

b. Dependent Variable: lnResSq

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.973	9.604		-.205	.838
	lnTeacher	-1.689	3.193	-.085	-.529	.600

a. Dependent Variable: lnResSq



White Park Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.070[a]	.005	-.021	1.85087

a. Predictors: (Constant), lnWhite

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.632	1	.632	.185	.670[a]
	Residual	130.177	38	3.426		
	Total	130.809	39			

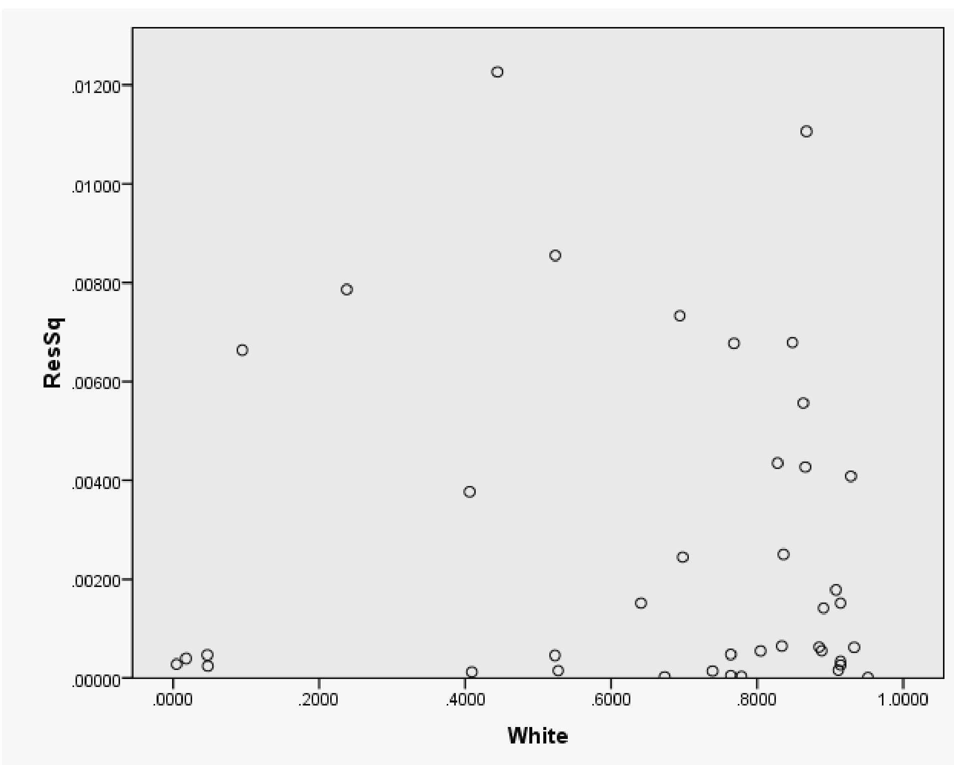
a. Predictors: (Constant), lnWhite

b. Dependent Variable: lnResSq

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-6.971	.345		-20.236	.000
	lnWhite	.107	.249	.070	.430	.670

a. Dependent Variable: lnResSq



Female Park Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.096[a]	.009	-.017	1.84682

a. Predictors: (Constant), lnFemale

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.200	1	1.200	.352	.557[a]
	Residual	129.609	38	3.411		
	Total	130.809	39			

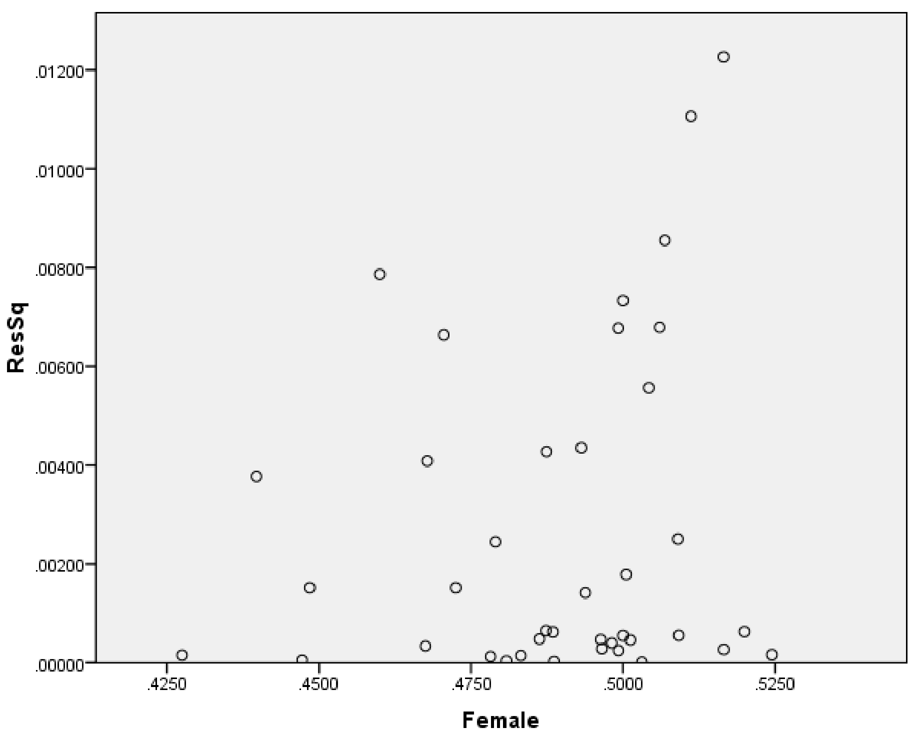
a. Predictors: (Constant), lnFemale

b. Dependent Variable: lnResSq

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.353	4.555		-.956	.345
	lnFemale	3.765	6.347	.096	.593	.557

a. Dependent Variable: lnResSq



Free Lunch Rate Park Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.137[a]	.019	-.007	1.83783

a. Predictors: (Constant), lnFree_Lunch_Rate

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.459	1	2.459	.728	.399[a]
	Residual	128.350	38	3.378		
	Total	130.809	39			

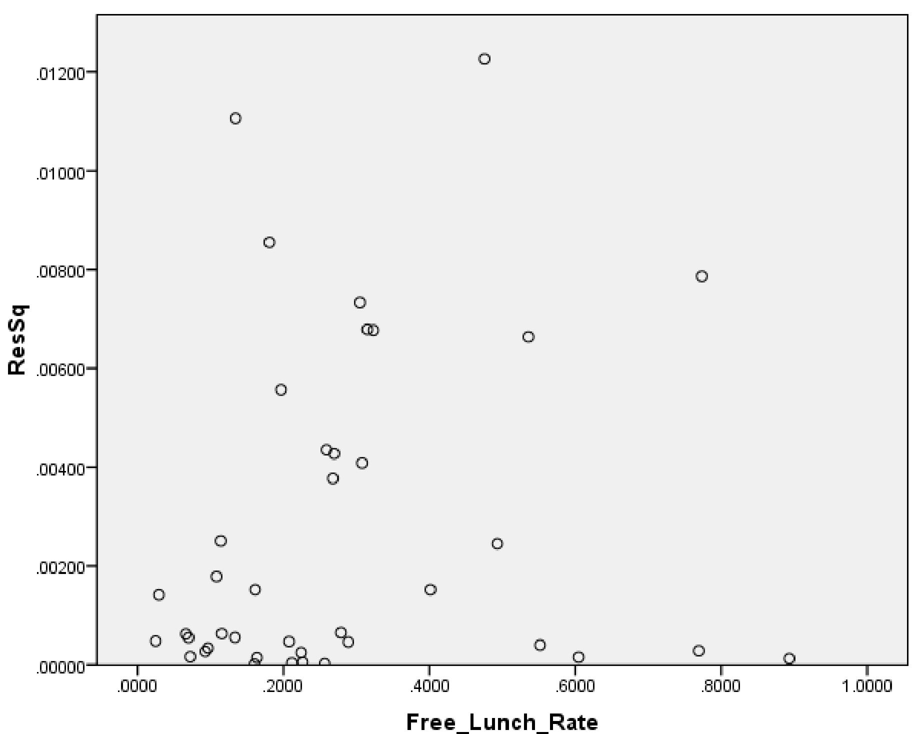
a. Predictors: (Constant), lnFree_Lunch_Rate

b. Dependent Variable: lnResSq

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-6.572	.630		-10.429	.000
	lnFree_Lunch_Rate	.304	.357	.137	.853	.399

a. Dependent Variable: lnResSq



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Local Revenue Park Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.148[a]	.022	-.004	1.83502

a. Predictors: (Constant), lnLocal_Rev

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.852	1	2.852	.847	.363[a]
	Residual	127.957	38	3.367		
	Total	130.809	39			

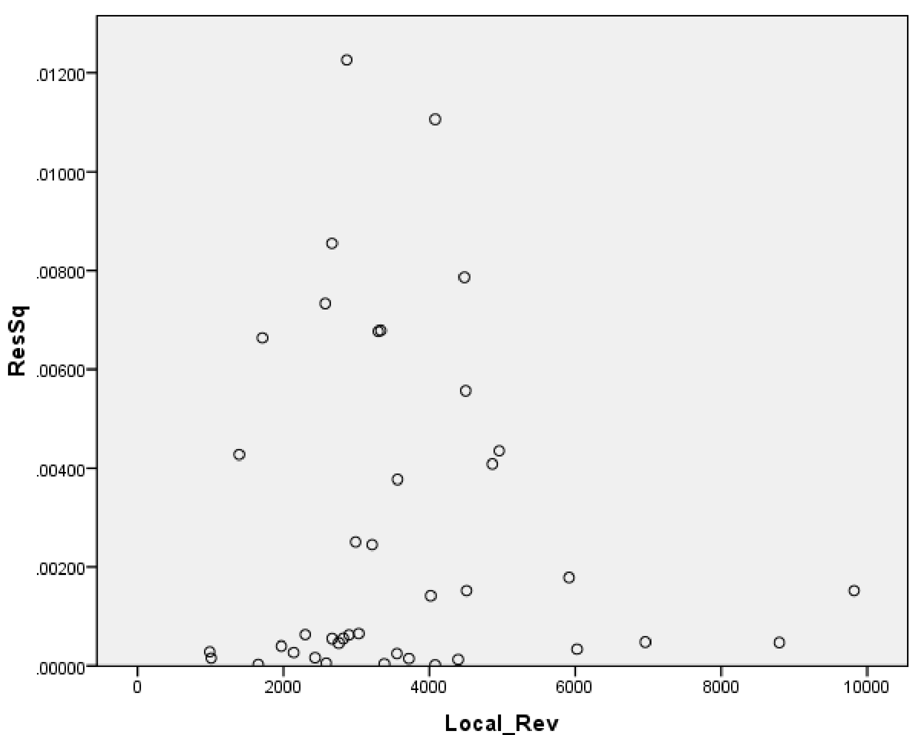
a. Predictors: (Constant), lnLocal_Rev

b. Dependent Variable: lnResSq

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-11.421	4.759		-2.400	.021
	lnLocal_Rev	.541	.588	.148	.920	.363

a. Dependent Variable: lnResSq



Violent Crime Park Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.014[a]	.000	-.026	1.85517

a. Predictors: (Constant), lnvcrime_rate

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.025	1	.025	.007	.932[a]
	Residual	130.783	38	3.442		
	Total	130.809	39			

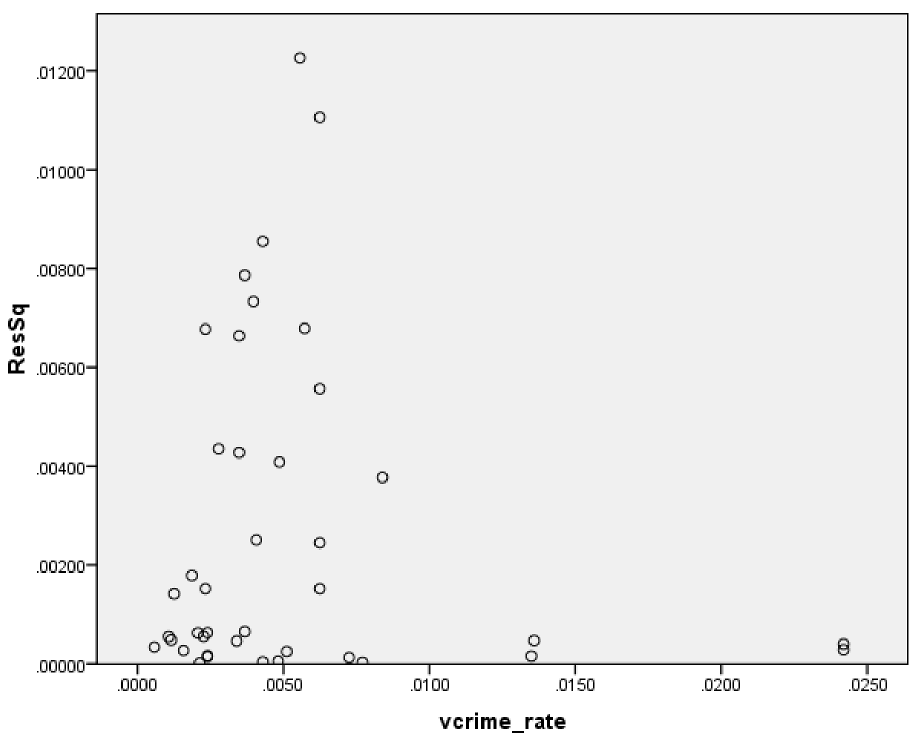
a. Predictors: (Constant), lnvcrime_rate

b. Dependent Variable: lnResSq

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-6.870	2.101		-3.269	.002
	lnvcrime_rate	.032	.374	.014	.086	.932

a. Dependent Variable: lnResSq



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MEAP Science & Math Park Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.094[a]	.009	-.017	1.84720

a. Predictors: (Constant), lnMEAP

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.148	1	1.148	.336	.565[a]
	Residual	129.661	38	3.412		
	Total	130.809	39			

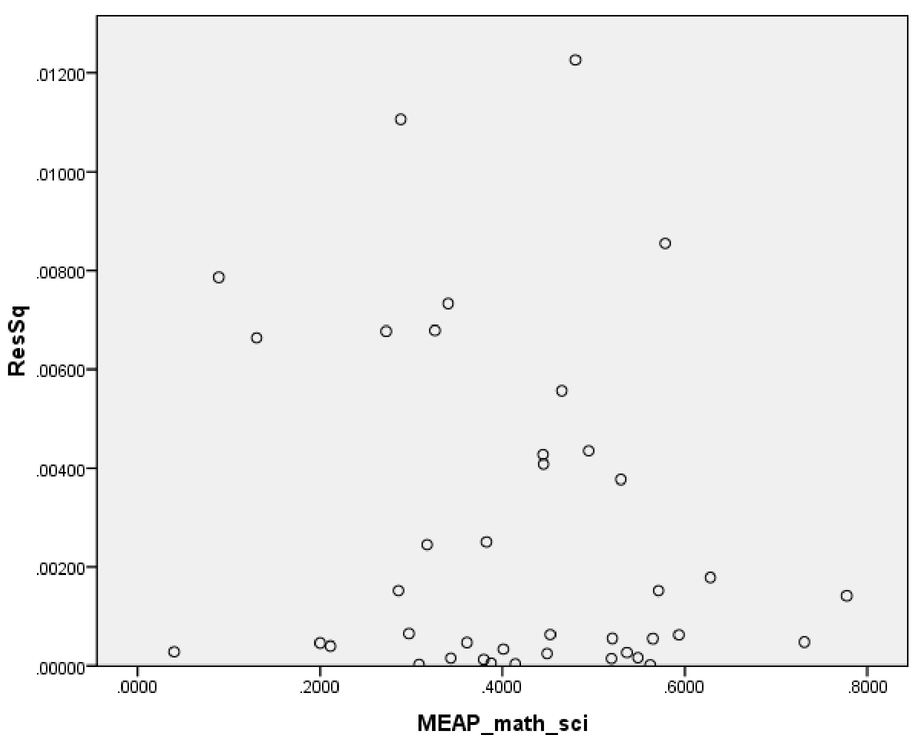
a. Predictors: (Constant), lnMEAP

b. Dependent Variable: lnResSq

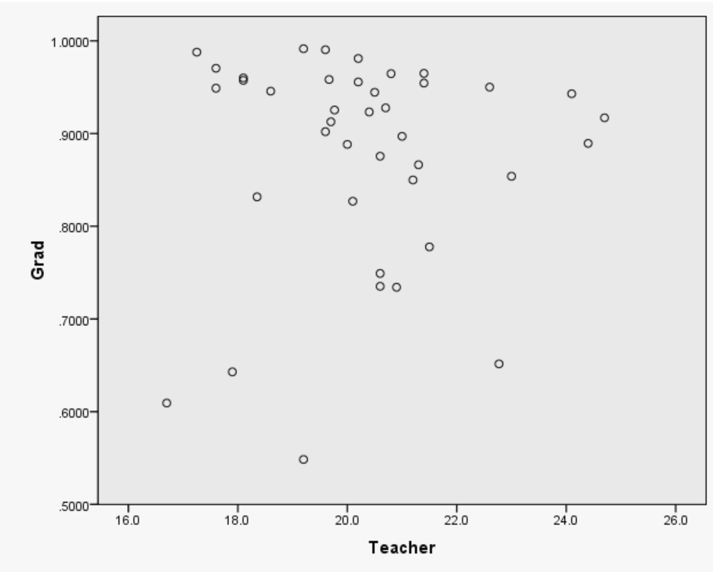
Coefficients[a]

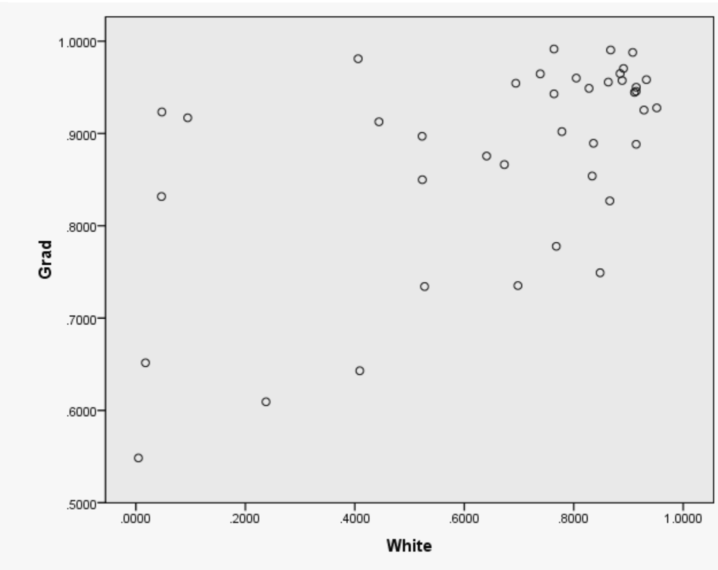
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-7.350	.595		-12.354	.000
	lnMEAP	-.304	.525	-.094	-.580	.565

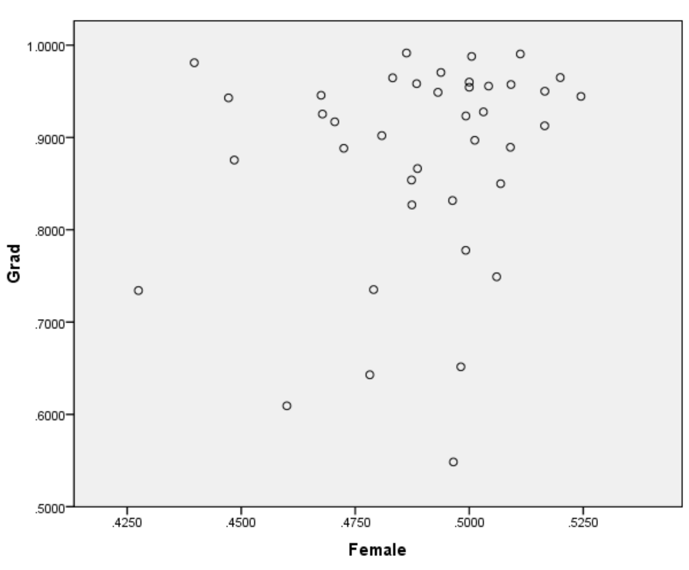
a. Dependent Variable: lnResSq

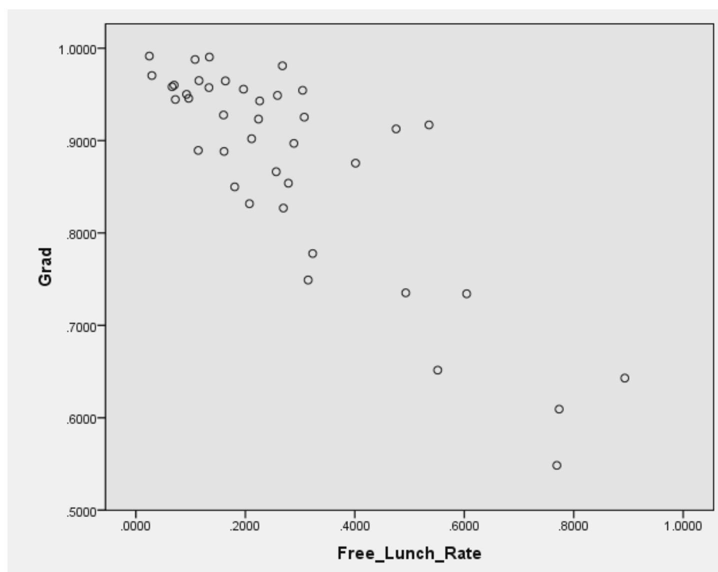


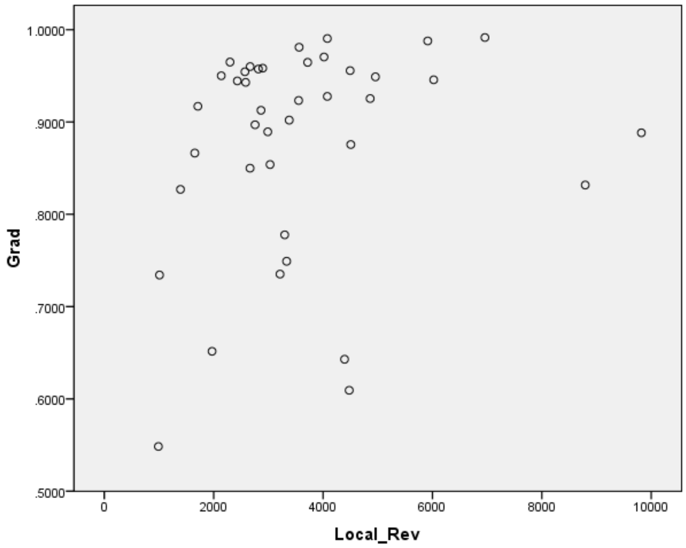
Appendix D: Scatter Plots







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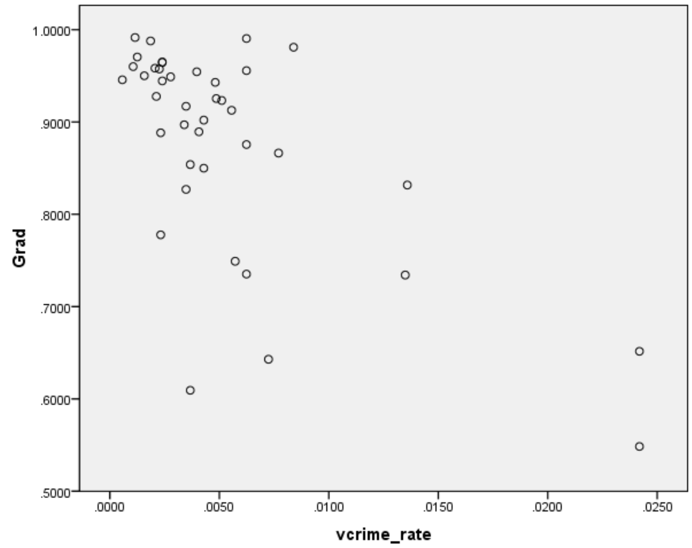
.7000
.6000
.5000
0
2000
4000
6000
8000
10000
Local_Rev


Grad
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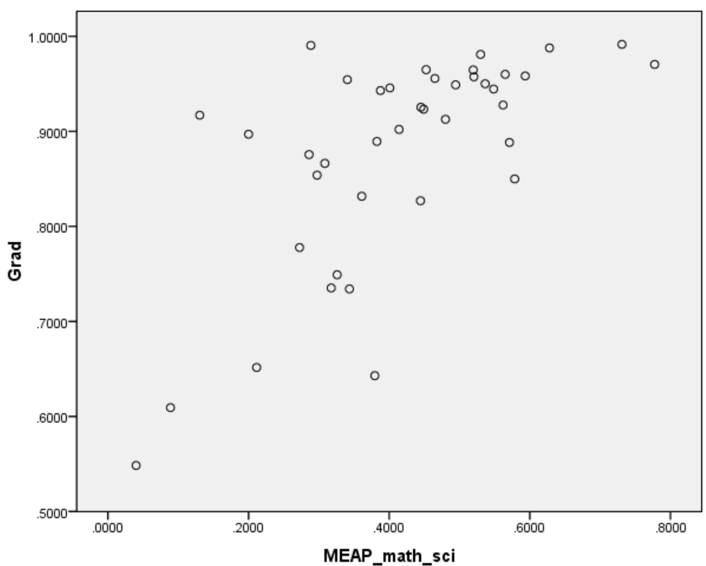
.5000
.0000
.0050
.0100
.0150
.0200
.0250
vcrime_rate


Grad
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.7000
.6000
.5000
.0000
.2000
.4000
.6000
.8000
MEAP_math_sci

Appendix E: Data Sets

District	City	Grad	Teacher	White	Female	Free Lunch Rate	Local Rev	VCrime Rate	MEAP Math Sci	Residuals
Detroit City School District	Detroit	0.6516	22.8	0.0176	0.4982	0.5515	1970	0.0242	0.2115	-0.0200
Grosse Pointe Public Schools	Grosse Pointe	0.9705	17.6	0.8910	0.4938	0.0292	4017	0.0013	0.7775	-0.0376
South Lake Schools	St. Clair Shores	0.9646	20.8	0.7389	0.4832	0.1636	3718	0.0024	0.5195	0.0120
East Detroit Public Schools	Eastpointe	0.8663	21.3	0.6732	0.4887	0.2563	1654	0.0077	0.3085	-0.0047
Van Dyke Public Schools	Warren	0.7352	20.6	0.6980	0.4790	0.4930	3213	0.0062	0.3175	-0.0495
Hamtramck Public Schools	Hamtramck	0.7342	20.9	0.5275	0.4275	0.6044	1009	0.0135	0.3435	-0.0123
Lakeview Public Schools	St. Clair Shores	0.9445	20.5	0.9110	0.5245	0.0721	2432	0.0024	0.5485	-0.0127
Roseville Community Schools	Roseville	0.9429	24.1	0.7639	0.4472	0.2262	2585	0.0048	0.3875	0.0072
Center Line Public Schools	Center Line	0.9489	17.6	0.8279	0.4931	0.2587	4957	0.0028	0.4945	0.0660
Fitzgerald Public Schools	Warren	0.8756	20.6	0.6408	0.4485	0.4014	4507	0.0062	0.2860	0.0390
Highland Park City Schools	Detroit	0.5484	19.2	0.0046	0.4965	0.7691	989	0.0242	0.0400	-0.0168
Warren Woods Public Schools	Warren	0.9904	19.6	0.8675	0.5112	0.1343	4078	0.0062	0.2885	0.1052
Lake Shore Public Schools	St. Clair Shores	0.9649	21.4	0.8848	0.5200	0.1152	2298	0.0024	0.4525	0.0251
Warren Consolidated Schools	Warren	0.9556	20.2	0.8631	0.5042	0.1966	4495	0.0062	0.4650	0.0746
Hazel Park City School District	Hazel Park	0.7491	20.6	0.8482	0.5060	0.3148	3334	0.0057	0.3260	-0.0824
Fraser Public Schools	Fraser	0.9574	18.1	0.8884	0.5091	0.1335	2817	0.0023	0.5205	0.0235
Clintondale Community Schools	Clinton Township	0.8970	21.0	0.5229	0.5012	0.2886	2756	0.0034	0.2000	0.0214
Ferndale Public Schools	Ferndale	0.9127	19.7	0.4441	0.5165	0.4754	2865	0.0056	0.4800	0.1107
Lamphere Public Schools	Madison Heights	0.8883	20.0	0.9141	0.4725	0.1611	9820	0.0023	0.5710	-0.0390
Madison Public Schools	Madison Heights	0.7778	21.5	0.7682	0.4992	0.3230	3299	0.0023	0.2725	-0.0823
School District of the City of Royal Oak	Royal Oak	0.9878	17.3	0.9078	0.5005	0.1081	5914	0.0019	0.6280	0.0423
Dearborn City School District	Dearborn	0.9254	19.8	0.9283	0.4678	0.3076	4861	0.0049	0.4450	0.0639
Oak Park City School District	Oak Park	0.9233	20.4	0.0475	0.4993	0.2240	3553	0.0051	0.4490	-0.0157
MT. Clemens Community School District	Mount Clemens	0.6429	17.9	0.4090	0.4782	0.8932	4393	0.0072	0.3795	0.0112
Melvindale-North Allen Park Schools	Melvindale	0.9544	21.4	0.6942	0.5000	0.3047	2571	0.0040	0.3405	0.0856
Utica Community Schools	Total Utica Area	0.9583	19.7	0.9328	0.4885	0.0661	2896	0.0021	0.5935	-0.0250
Clawson City School District	Clawson	0.9457	18.6	0.9140	0.4675	0.0964	6022	0.0006	0.4010	-0.0184
Berkley School District	Berkley	0.9600	18.1	0.8046	0.5000	0.0698	2666	0.0011	0.5650	-0.0235
Lincoln Park Public Schools	Lincoln Park	0.8539	23.0	0.8337	0.4873	0.2786	3031	0.0037	0.2975	-0.0255
Allen Park Public	Allen Park	0.9501	22.6	0.9142	0.5166	0.0926	2139	0.0016	0.5365	-0.0163

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Schools										
Southfield Public School District	Southfield	0.8317	18.4	0.0468	0.4963	0.2075	8794	0.0136	0.3610	-0.0216
Troy School District	Troy	0.9915	19.2	0.7639	0.4862	0.0245	6959	0.0011	0.7310	-0.0219
South Redford School District	Redford Township	0.8499	21.2	0.5234	0.5069	0.1806	2664	0.0043	0.5785	-0.0925
Dearborn Heights School District #7	Dearborn Heights	0.8270	20.1	0.8659	0.4874	0.2695	1392	0.0035	0.4445	-0.0654
Westwood Community Schools	Dearborn Heights	0.9170	24.7	0.0946	0.4705	0.5356	1711	0.0035	0.1305	0.0815
Wyandotte City School District	Wyandotte	0.9277	20.7	0.9517	0.5031	0.1601	4077	0.0021	0.5620	-0.0031
Southgate Community School District	Southgate	0.8894	24.4	0.8361	0.5090	0.1139	2989	0.0041	0.3825	-0.0501
Redford Union School District	Redford Township	0.9020	19.6	0.7783	0.4808	0.2114	3381	0.0043	0.4140	-0.0057
Ecorse Public School District	Lincoln Park	0.6093	16.7	0.2378	0.4600	0.7733	4478	0.0037	0.0890	-0.0887
City of Harper Woods Schools	Harper Woods	0.9810	20.2	0.4060	0.4397	0.2677	3562	0.0084	0.5300	0.0614

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